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REVISION : 20-Dec-10

DEVICE SPECIFICATION FOR

TFT-LCD Module

MODEL No.

LQ121S1DC71

These parts have corresponded with the RoHS

BY _____

BY K. Shiono

K.Shiono
GENERAL MANAGER
ENGINEERING DEPARTMENT I
LIQUID CRYSTAL DISPLAY DIVISION III
LIQUID CRYSTAL DISPLAY GROUP
SHARP CORPORATION

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RECORDS OF REVISION

LQ121S1DC71

SPEC No.	DATE	REVISED No	PAGE	SUMMARY	NOTE
LD-22X04A	2010/10/21			-	
LD-22X04B	2010/12/20	△1	P.2	Error correction (×) LVDS ⇒ (○) 18 bit data signal	
			P.6	0ms < t2 < 20ms ⇒ 20ms < t2 < 200ms	
			P.7	It added it to【Note】. ("Please drive the～")	

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1. Application

This specification applies to the color TFT-LCD module LQ121S1DC71.

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The device listed in this specification was designed and manufactured for use in general electronic equipment.

In case of using the device for applications such as control and safety equipment for transportation (controls of aircraft, trains, automobiles, etc.), rescue and security equipment and various safety related equipment which require higher reliability and safety, take into consideration that appropriate measures such as fail-safe functions and redundant system design should be taken.

Do not use the device for equipment that requires an extreme level of reliability, such as aerospace applications, telecommunication equipment (trunk lines), nuclear power control equipment and medical or other equipment for life support.

SHARP assumes no responsibility for any damage resulting from the use of the device which does not comply with the instructions and the precautions specified in this specification .

in Fig.3 below.

Contact and consult with a SHARP sales representative for any questions about this device.

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2. Overview

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, control circuit, power supply circuit and a White-LED Backlight unit. Graphics and texts can be displayed on a 800×RGB×600dots panel with about 260 thousand colors by supplying 18 bit data signal (6bit/color), two timing signals, +3.3V DC supply voltages for TFT-LCD panel driving and supply voltage for backlight. △1

The maximum viewing angle is in the 6o'clock direction.

The 12o'clock direction is difficult to reverse the grayscale.

The LED driver circuit and the PWM circuit to drive the backlight are not built into the module.

3. Mechanical technical literatures

Parameter	technical literatures	Unit
Display size	31(12.1inch)Diagonal	cm
Active area	246(H)×184.5(V)	mm
Pixel format	800(H)×600(V) (1pixel=R+G+B dot)	pixel
Aspect ratio	4:3	
Pixel pitch	0.3075(H)×0.3075(V)	mm
Pixel configuration	R,G,B vertical stripe	
Display mode	Normally white	
Unit outline dimensions	265.0(W)×205.0(H)×9.5(D)	mm
Mass(MAX)	550	g
Surface treatment	Clear and hard-coating 3H	

Outline dimensions are shown in Fig.1.

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4. Input Terminals

4-1. TFT-LCD panel driving

CN1 (Interface signals and +3.3V power supply)

Using connectors : FA5B030HP1 (Japan Aviation Electronics industry Co., Ltd.)

Connector specification : 0.5mm pitch/Gold-plate/Point of contact in the under

Corresponding FPC/FFC : 0.5mm pitch/Gold-plate/Thickness 0.3±0.05mm (With reinforcement version)

Pin	Symbol	Function	Remark
1	RL/UD	Horizontal/Vertical display mode select signal	【*1】
2	DE	Enable signal	Negative polarity
3	(Vsync)	Vsync signal	Negative polarity【*2】
4	(Hsync)	Hsync signal	Negative polarity【*2】
5	GND	GND	
6	B5	BLUE data signal (MSB)	
7	B4	BLUE data signal	
8	B3	BLUE data signal	
9	B2	BLUE data signal	
10	B1	BLUE data signal	
11	B0	BLUE data signal (LSB)	
12	GND	GND	
13	G5	GREEN data signal (MSB)	
14	G4	GREEN data signal	
15	G3	GREEN data signal	
16	G2	GREEN data signal	
17	G1	GREEN data signal	
18	G0	GREEN data signal (LSB)	
19	GND	GND	
20	R5	RED data signal (MSB)	
21	R4	RED data signal	
22	R3	RED data signal	
23	R2	RED data signal	
24	R1	RED data signal	
25	R0	RED data signal (LSB)	
26	GND	GND	
27	CN	Clock signals that sample each data	
28	GND	GND	
29	Vcc	+3.3V Power supply	
30	Vcc	+3.3V Power supply	

RL/UD = LOW

RL/UD = HIGH

【*2】 As for the display beginning position, the thing for which it provides only by DE is possible.

(The input of Hsync and Vsync signal is unnecessary.)

Specification of input timing is shown in 7.

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4-2. LED backlight

LED backlight connector

CN2 Used connector : SM06B-SHLS-TF (J.S.T. Mfg. Co. Ltd)

Corresponding connector : SHLP-06V-S-B (J.S.T. Mfg. Co. Ltd)

Connector No.	Pin No.	symbol	function
CN2	1	anode1+	LED power supply (Ch1 High voltage side)
	2	anode2+	LED power supply (Ch2 High voltage side)
	3	anode3+	LED power supply (Ch3 High voltage side)
	4	cathode3-	LED power supply (Ch3 Low voltage side)
	5	cathode2-	LED power supply (Ch2 Low voltage side)
	6	cathode1-	LED power supply (Ch1 Low voltage side)

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5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings	Unit	Remark
Supply voltage	Vcc	Ta=25℃	-0.3 ～ +4.0	V	【*1,2】
Input voltage	V I	Ta=25℃	-0.3 ～ +Vcc+0.3	V	【*3】
LED current	I_L	-	90	mA	【*4】
Storage temperature	T_{STG}	-	-30 ～ +75	℃	【*5】
Operating temperature	T_{OPA}	-	-15 ～ +75	℃	【*1,6】

【*1】 Humidity:95%RH Max.(Ta≦40℃) Note static electricity.

Maximum wet-bulb temperature at 39℃ or less. (Ta>40℃) No condensation.

【*2】 The Vcc power supply capacity must use the one of 2A or more.

【*3】 CK, R0～R5, G0～G5, B0～B5, Hsync, Vsync, DE,RL／UD

【*4】 anode1,anode2,anode3 for 1ch

【*5】 There is a possibility of causing deterioration in the irregularity and others of the screen and the display fineness though the liquid crystal module doesn't arrive at destruction when using it at 65～75℃.

There is a possibility of causing the fineness deterioration by the prolonged use in the (high temperature) humidity environment (60% or more).

【*6】 In the operating temperature item, the low temperature side is the ambient temperature regulations.

The high temperature side is the panel surface temperature regulations.

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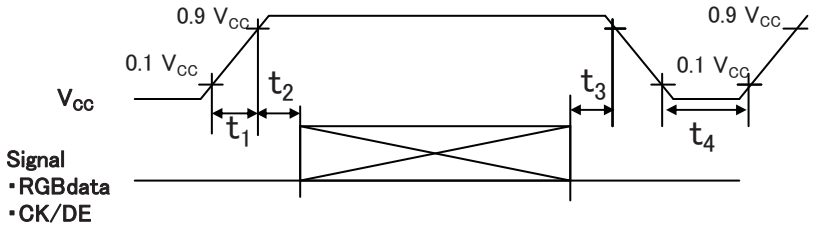
6. Electrical Characteristics

6-1. TFT-LCD panel driving

T_a＝+25℃

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Supply voltage	V_{CC}		3.0	3.3	3.6	V	【*1】
Current dissipation	I_{CC}	Vcc=3.3V	–	350	400	mA	【*2】
Input voltage	V_{IH}		2.1	–	–	V	【*3】【*4】
	V_{IL}		—	–	0.8	V	
Input reak current 1	I_{OH1}		—	–	400	μA	【*3】
	I_{OL1}		-10	–	10	μA	【*3】
Input reak current 2	I_{OH1}		—	–	400	μA	【*4】
	I_{OL1}		-10	–	10	μA	【*4】

【*1】 On-off conditions for supply voltage



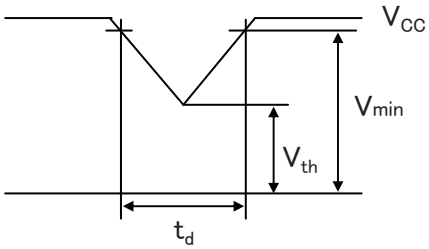
$20us < t_1 \leqq 10ms$

$20ms < t_2 \leqq 200ms$ △1

$0 < t_3 \leqq 1s$

$1s \leqq t_4$

Vcc-dip conditions



V_{th} = 2.5V

$Vth < V_{CC} \leqq Vmin$

$t_d \leqq 10ms$

$V_{CC} < V_{th}$

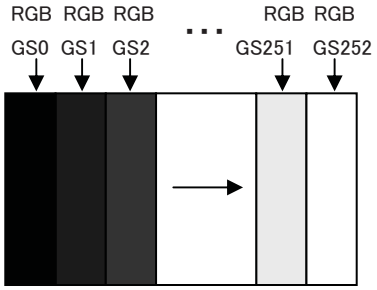
Vcc-dip conditions should also follow the On-off conditions for supply voltage

- Please start the ENAB signal by V_{IL} voltage value.
- Hsync/Vsync need not be input so that this model may drive only by the ENAB signal.

【*2】 Current dissipation

Typical current situation : 64-gray-bar pattern

(Vcc=+3.3V、fck = 40MHz、Ta=25℃)



【*3】 CK, R0～R5, G0～G5, B0～B5, (Hsync), (Vsync), DE

【*4】 RL/UD

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6-2. LED backlight driving

Ta＝+25℃

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED voltage	VL	–	26.0	30.0	V	
LED current	I_L	–	80	90	mA	for 1ch【*1】
Number of LED channels	–	–	3.0	–	–	【*2】
Power consumption	WL	–	6.24	8.10	W	【*3】
Life time	L	–	(50,000) (Module)	–	Hour	【Reference】 【*4】

【*1】The LED current will recommend using by 80mA or less.

【*2】LED_FPC is composed of 8 series × 3ch.

【*3】The power consumption is calculated by "I_L × VL ×3ch".

【*4】Condition① State of lighting:

・Environmental temperature: 25℃

・LED current: 80mA (Fixed current drive, Continuous lighting)

Condition② Definition of longevity:

・Brightness is time to reaching to 50% of initial brightness (Under condition①).

【Note】Please do not light it connecting the input terminal of the LED each channel in parallel.
The overcurrent flows to one where VL is low when VL of each channel is different, and the LED longevity might shorten.

Please design to connect the current limitation resistance without fail in the circuit, and to drive in ratings.

Please design so that the excess voltage (overcurrent) should not hang momentarily when the circuit is turned on, and turned off.

Please design so that the average current value may become it in ratings when it is used by the pulse drive.

Please design so that the backward voltage should not hang when LED is turned off.

Please drive the LED of each channel at a constant current.
Please build the protection circuit into the system to not generate the overcurrent and overvoltage in abnormal circumstances. △1

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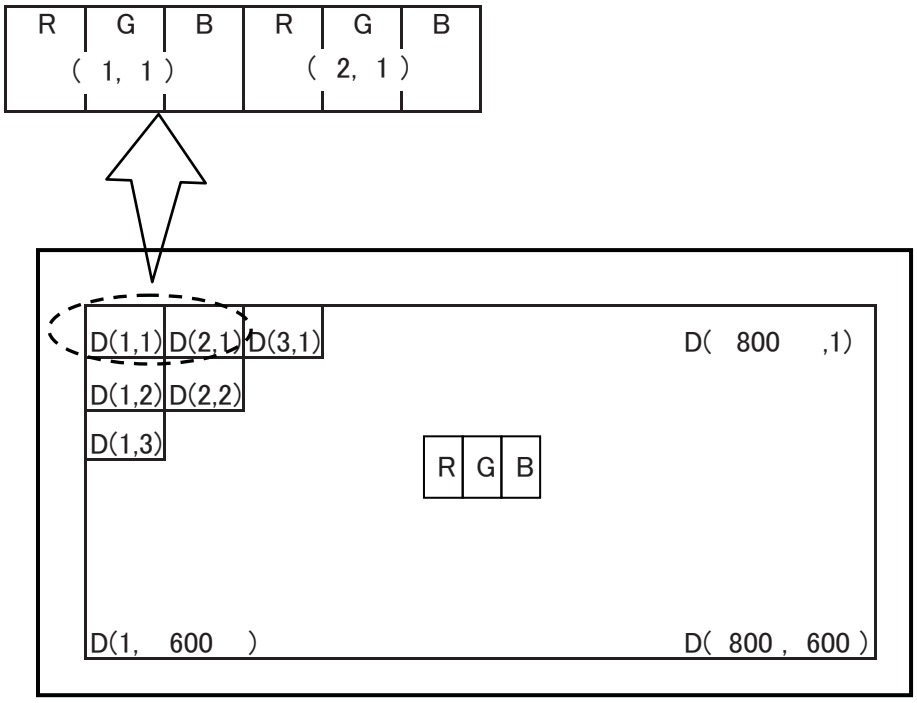
7. Timing characteristics of input signals

7-1. Timing characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	35	40	42	MHz	
	High time	Tch	6	–	–	ns	
	Low time	Tcl	6	–	–	ns	
Data	Setup time	Tds	3	–	–	ns	
	Hold time	Tdh	5	–	–	ns	
ENAB	Setup time	Tes	5	–	–	ns	
ENAB	Horizontal period	TH	832	1056	1395	clock	
			23.5	26.4	39.9	μs	
	Horizontal period (High)	THd	800	800	800	clock	
	Vertical Frequency	TV	625	666	798	line	【*1】
			–	16.7	–	ms	
	Vertical period (High)	TVd	600	600	600	line	

【*1】 In case of using the long vertical period, the deterioration of display quality, flicker etc. may occur.

7-2. Input Data Signals and Display Position on the screen



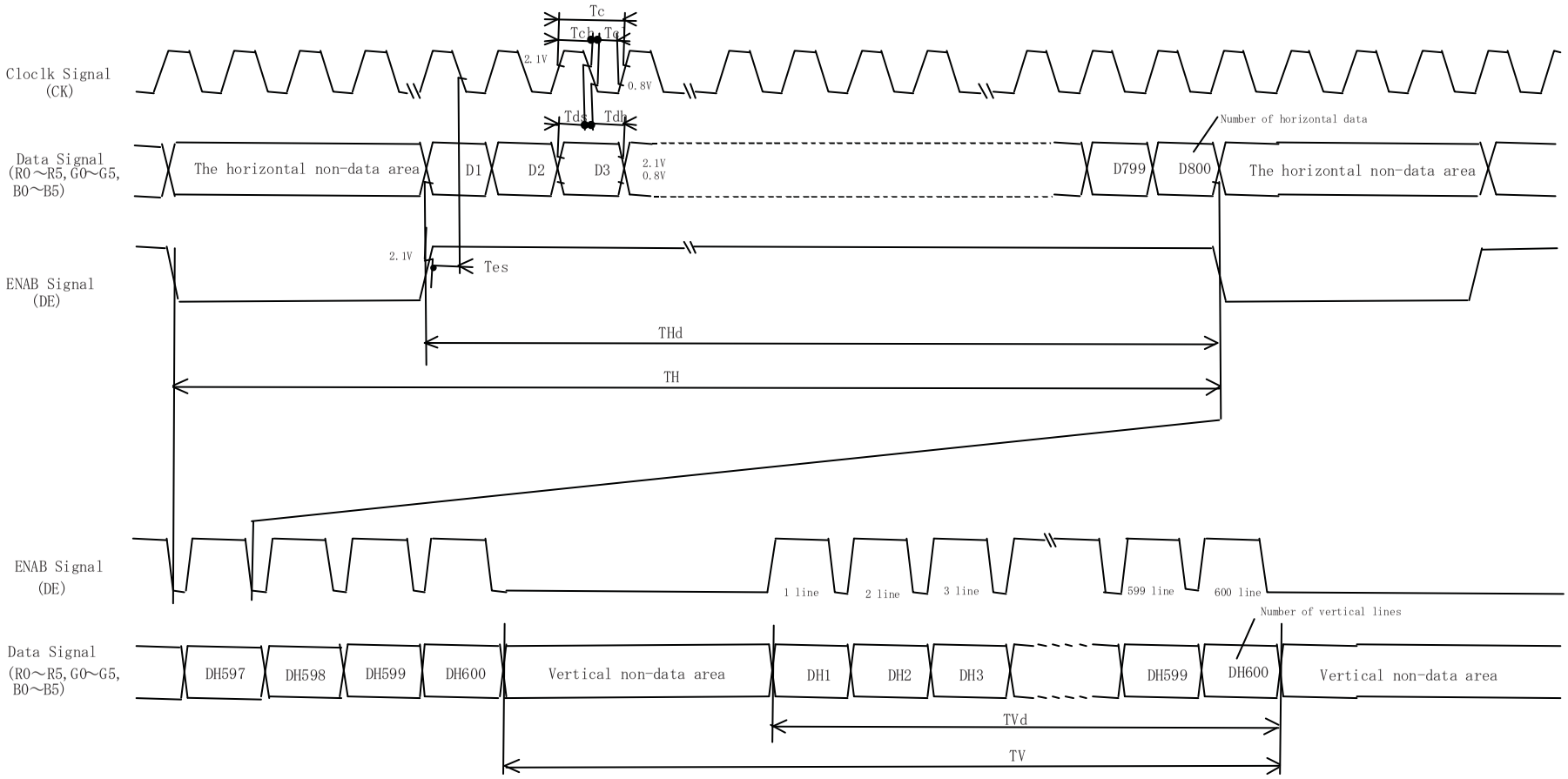


Fig2 Input signal timing

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8. Input Signals, Basic Display Colors and Gray Scale of Each Color

	Colors & Gray scale	Data signal																	
		GrayScale	R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
Basic Color	Black	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	–	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Green	–	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan	–	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	–	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	–	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	–	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	–	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	↓				↓						↓						↓		
	↓	↓				↓						↓						↓		
	Brighter	GS61	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	↓	GS62	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS63	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	GS1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	↑	↓				↓						↓						↓		
	↓	↓				↓						↓						↓		
	Brighter	GS61	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	↓	GS62	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
	Green	GS63	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	GS1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	↑	↓				↓						↓						↓		
	↓	↓				↓						↓						↓		
	Brighter	GS61	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	↓	GS62	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Blue	GS63	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Each basic color can be displayed in 64 gray scales from 6 bit data signals. According to the combination of total 18 bit data signals, the 260 thousand color display can be achieved on the screen.

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9. Optical Characteristics

Ta=+25℃, Vcc=+3.3V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ 21, θ 22	CR>10	60	80	–	Deg.	【*1,2,4】
	Vertical	θ 11		35	60	–	Deg.	
		θ 12		60	80	–	Deg.	
Contrast ratio		CR	optimized angle	500	800	–		【*2,4】
Response Time	White Black	τ r + τ d	θ =0°	–	30	–	ms	【*3,4】
Chromaticity of White		Wx		0.250	0.300	0.350		【*4】
		Wy		0.270	0.320	0.370		
Chromaticity of Red		Rx		–	0.560	–		
		Ry		–	0.330	–		
Chromaticity of Green		Gx		–	0.335	–		
		Gy		–	0.595	–		
Chromaticity of Blue		Bx		–	0.155	–		
		By		–	0.115	–		
Luminance of white		Y_{L1}		600	800	–	cd/m^2	【*4】 I_L=80mA
White Uniformity				–	–	1.33		【*5】

※The measurement shall be executed 30 minutes after lighting at rating.

The optical characteristics shall be measured in a dark room or equivalent state with the method shown

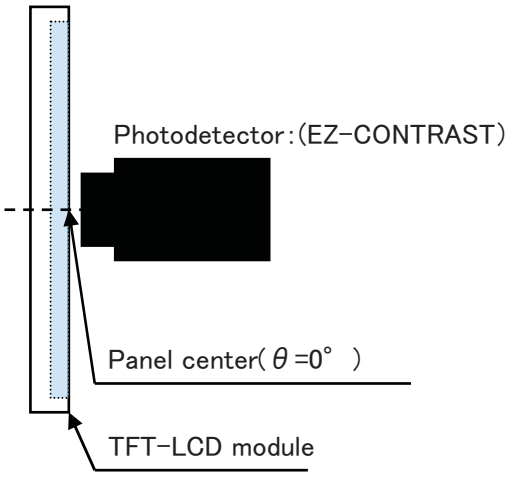

fig.3-1 Measuring method of Viewing angle range.

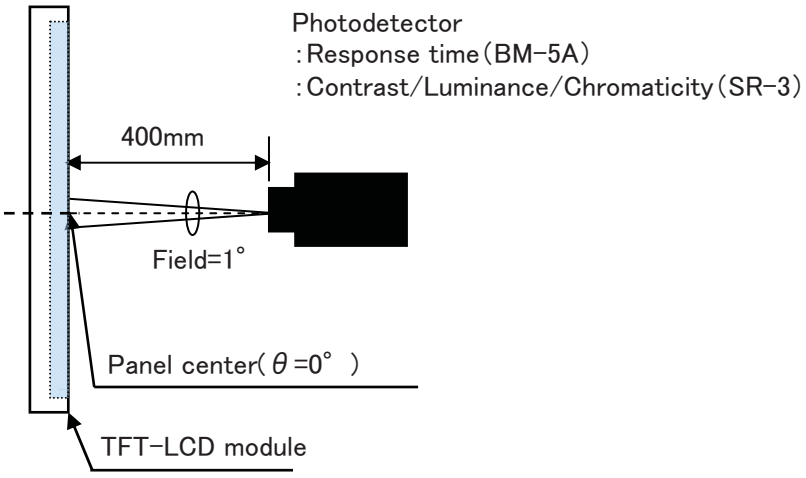

fig.3-2 Measuring method of contrast, luminance, response time, and Chromaticity.

Fig.3 Optical characteristics measurement method

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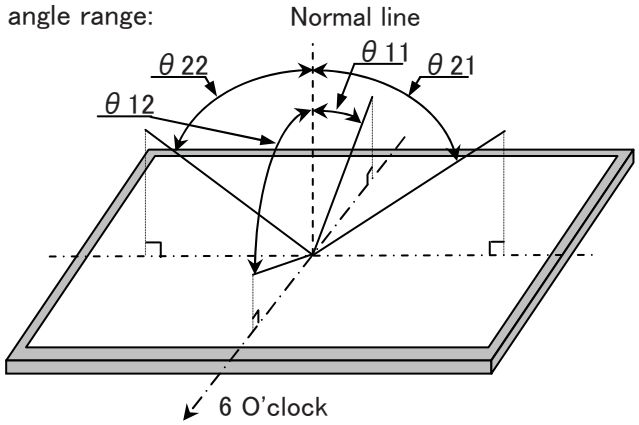
【*1】Definitions of viewing angle range:

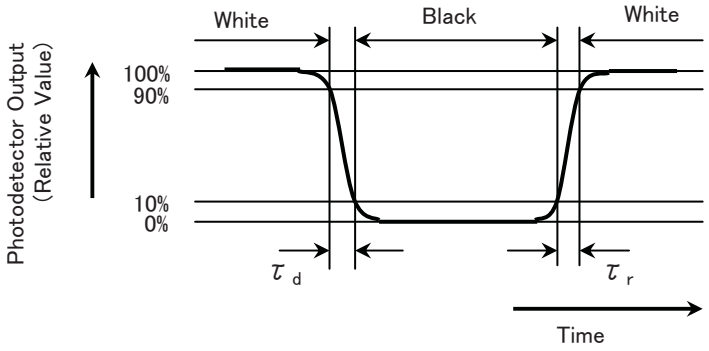


【*2】Definition of contrast ratio:

The contrast ratio is defined as the following. Contrast (CR) = $\frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$

【*3】Definition of response time:

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

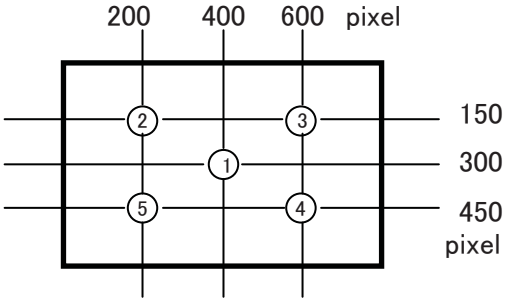


【*4】This shall be measured at center of the screen.

【*5】Definition of white uniformity:

White uniformity is defined as the following with five measurements.
(①～⑤)

$$\delta_w = \frac{\text{Maximum luminance of 5 points(①～⑤).}}{\text{Minimum luminance of 5 points(①～⑤).}}$$



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10. Handling Precautions

a) Be sure to turn off the power supply when inserting or disconnecting the cable.

b) Since the front polarizer is easily damaged, pay attention not to scratch it.

c) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.

d) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.

e) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.

f) Since CMOS LSI is used in this module, take care of static electricity and injure the human earth when handling. Observe all other precautionary requirements in handling components.

g) Since there is a circuit board in the module back, stress is not added at the time of a design assembly. Please make it like. If stress is added, there is a possibility that circuit parts may be damaged.

h) It causes an irregular display and the defective indication, etc., when always put constant pressure on the back of the module.
Please do not make the structure to press the back of the module.

i) Do not expose the LCD panel to direct sunlight. Lightproof shade etc. should be attached when LCD panel is used under such environment.

j) Connect GND to stabilize against EMI and external noise.

k) When handling LCD modules and assembling them into cabinets, please avoid that long-terms storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the modules. Do not use the LCD module under such environment.

l) Liquid crystal contained in the panel may leak if the LCD is broken. Rinse it as soon as possible if it gets inside your eye or mouth by mistake.

m) Be careful when using it for long time with fixed pattern display as it may cause accidential image.

n) Adjusting volume have been set optimally before shipment, so do not change any adjusted value. If adjusted value is changed, the specification may not be satisfied.

o) If a minute particle enters in the module and adheres to an optical material, it may cause display non-uniformity issue, etc. Therefore, fine-pitch filters have to be installed to cooling and inhalation hole if you intend to install a fan.

p) An abnormal display by changing in quality of the polarizing plate might occur regardless of contact or no contact to the polarizing plate, because of epoxy resin (amine system curing agent) that comes out from the material and the packaging material used for the set side, the silicon adhesive (dealcoholization system and oxime system), and the tray blowing agents (azo-compound), etc. Please confirm adaptability with your employed material.

q) Notice : Never take to pieces the module , because it will cause failure.

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11. Packing form

a) Piling number of cartons : MAX. 5

b) Package quantity in one carton: 20pcs

c) Carton size(TYP): 504mm(W) × 426mm(D)×326mm(H)

d) Total mass of one carton filled with full modules(20pcs): 13kg

12. Reliability test items

No.	Test item	Conditions	Remark
1	High temperature storage test	Ambient temperature 75℃ 240H	【Note1】
2	Low temperature strage test	Ambient temperature -30℃ 240H	【Note1】
3	High temperature & high humidity operation test	Ambient temperature 40℃、Humidity 95% RH 240H (No condensation.)	【Note1】
4	High temperature operation test	Panel surface 75℃ 240H	【Note1】
5	Low temperature operation test	Ambient temperature -15℃ 240H	【Note1】
6	Vibration test	＜Sin wave＞ Frequency :10～57Hz／Vibration width (one side) :0.076mm :57～500Hz／Gravity:9.8m/s2 Sweep time:11minutes Test period :3H(X, Y, Z direction 1H)	【Note1】
7	Shock test	Max. gravity:490m/s2 Pulse width:11ms Direction:±X,±Y,±Z Test period :1time／1direction	【Note1】

【Note1】 Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function. (normal operation state:Temperature:15～35℃, Humidity:45～75%, Atmospheric pressure:86～106kpa)

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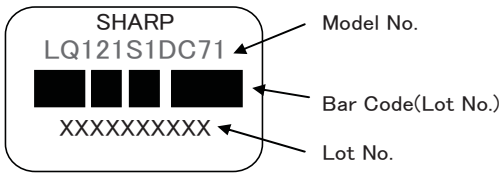
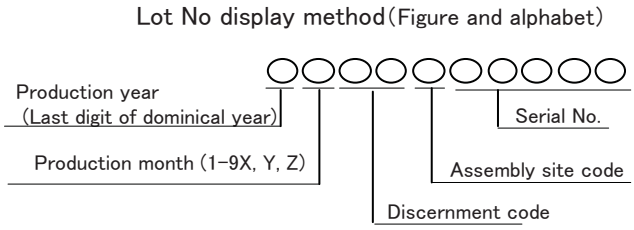
13. Others

13-1. Lot No Label:

A) Module serial label

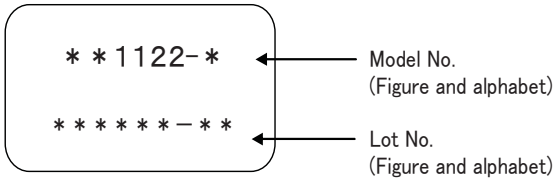
The label that displays SHARP・Model No.(LQ121S1DC71)・Lot No. is stuck on the back of the module.

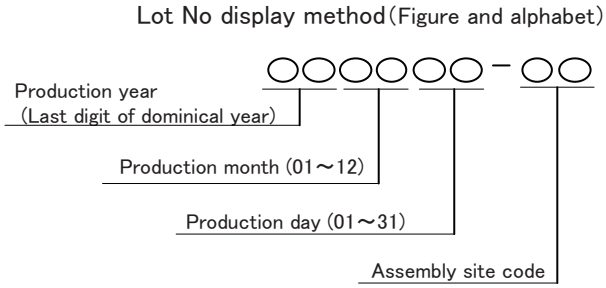




B) Backlight serial label

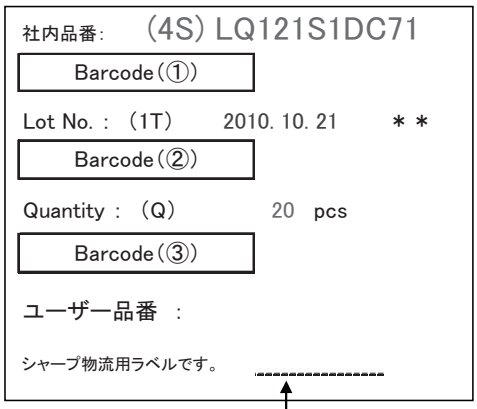
The label that displays the model No. and lot No. for the backlight is stuck on the back of the module.





13-2. Packing box Label:

The label that displays ①Model number(LQ121S1DC71) ②Lot number ③Quantity of module is stuck on the packing box. Moreover, the display of bar code also applies to this.



① Model number(LQ121S1DC71)
② Lot number (DATA)
③ Quantity of module

Our management product number might be filled
(Example: LQ121S1DC71A etc.)

A right picture is written to the packing box of module for the RoHS restriction.

※ R.C.(RoHs Compliance) means these parts have corresponded with the RoHs directive.
This module corresponds from the first sample to RoHS Directive.

R.C.

The figure below is written under the SHARP logo of the packing box about the production country.

MADE IN JAPAN OR MADE IN CHINA

13-3. The ozone-depleting substances is not used.

13-4. If any problem occurs in relation to the description of this specification , it shall be resolved through discussion with spirit of cooperation.

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14. Storage conditions

Environmental condition range of storage temperature and humidity

Temperature 0 to 40 degrees Celsius

Relative humidity 95% and below

【Note】Please refer below as a mean value of the environmental conditions.

Summer time temperature 20 to 35 degrees Celsius humidity , 85% and below

Winter time temperature 5 to 15 degrees Celsius humidity , 85% and below

Please maintain within 240 hours of accumulated length of storage time, with conditions of 40 degrees Celsius and room humidity of 95%.

Direct sun light

Please keep the product in a dark room or cover the product to protect from direct sun light.

Atmospheric condition

Please refrain from keeping the product with possible corrosive gas or volatile flux.

Prevention of dew

Please store the product carton either on a wooden pallet or a stand / rack to prevent dew.

Do not place directly on the floor. In addition, to obtain moderate ventilation in between the pallet's top and bottom surfaces, pile the cartons up in a single direction and in order.

Please place the product cartons away from the storage wall.

Storage period

Within above mentioned conditions, maximum storage period should be one year.

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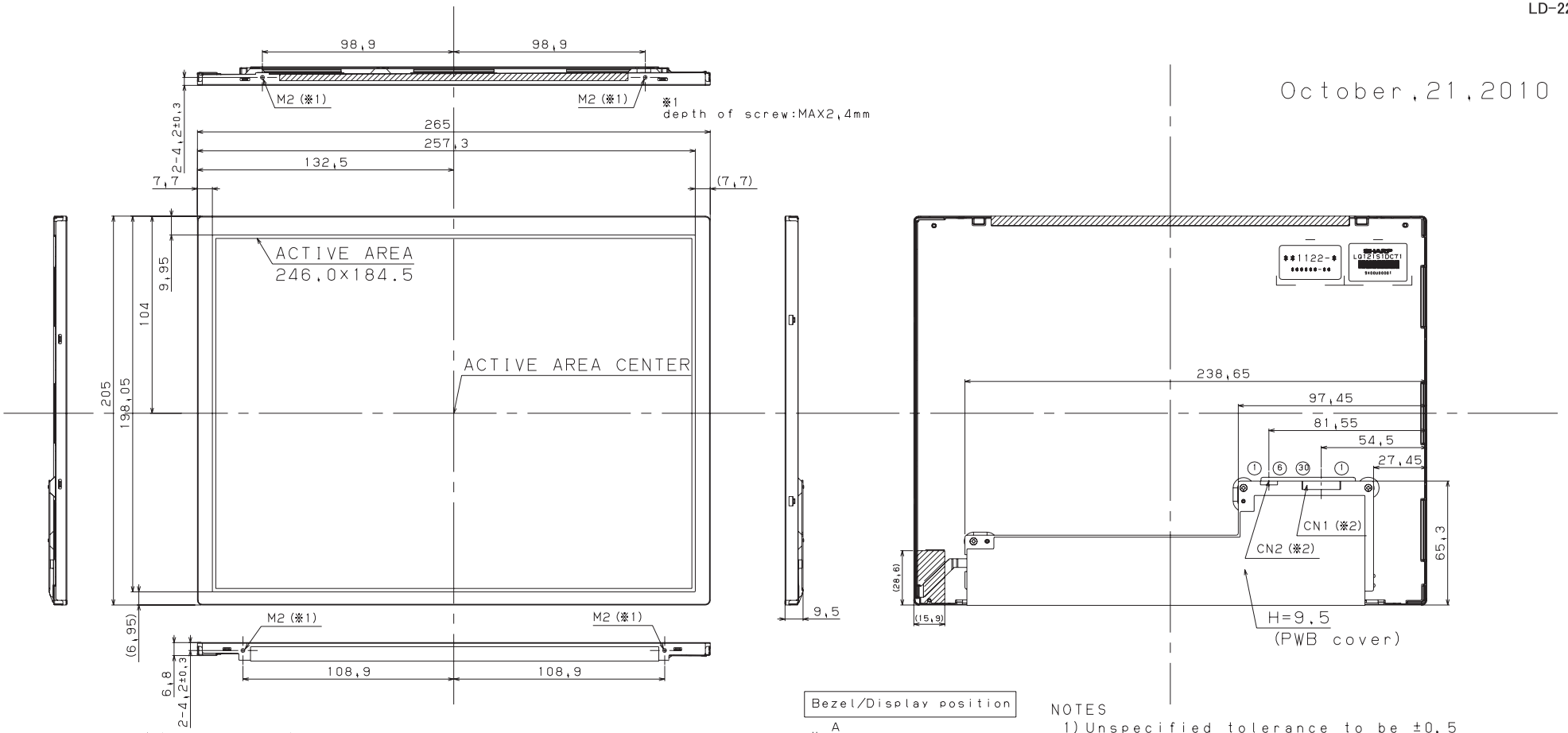
October，21，2010



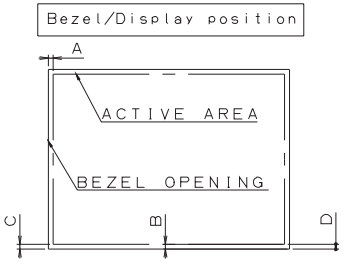
CN1：FA5B030HP1 (JAE)

pin	1	2	3	4	5	6	7
	RL/UD	DE	Vsync	Hsync	GND	B5	B4
8	9	10	11	12	13	14	15
B3	B2	B1	B0	GND	G5	G4	G3
16	17	18	19	20	21	22	23
G2	G1	G0	GND	R5	R4	R3	R2
24	25	26	27	28	29	30	
R1	R0	GND	CK	GND	Vcc	Vcc	

CN2：【LED Backlight connector】

CN2：SM06B-SHLS-TF (JST)

pin	1	2	3
	Anode1 (Ch1 High Voltage Side)	Anode2 (Ch2 High Voltage Side)	Anode3 (Ch3 High Voltage Side)
	4	5	6
	Cathode3 (Ch3 lOW Voltage Side)	Cathode2 (Ch2 Low Voltage Side)	Cathode1 (Ch1 Low Voltage Side)



NOTES

1) Unspecified tolerance to be ±0，5
2) Warp and flating for PWB cover and FPC are excluded from thickness and dimension of the unit.
3) Please do not contact the conductive things to the part of the PWB without the PWB cover.
4) Please the tapes of the part where hatching is done are not peeled off.
5) Recommended torque
0，147±0，02N·m (1，5±0，2kgf·cm)

1) Torelance X direction A:1，8±0，8
2) Torelance Y direction B:1，8±0，8
3) Obliquity of diplay area |C-D|<0，8

Fig 1 ： LQ121S1DC71 OUTLINE DIMENSIONS

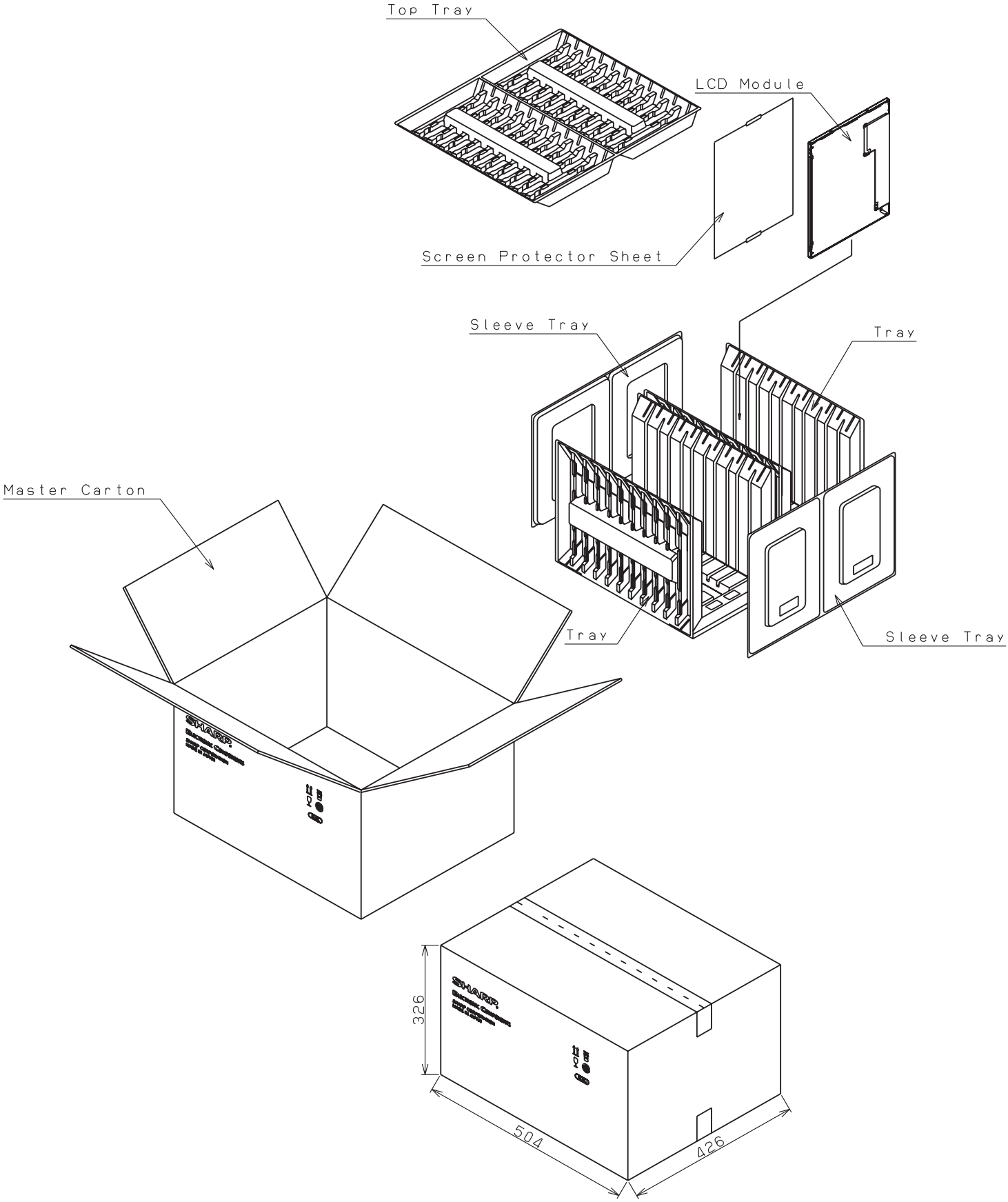


Fig 4 : Packing form